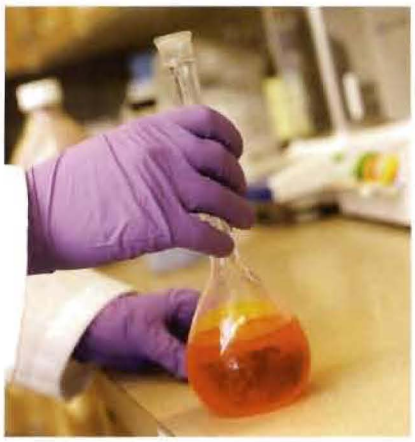
ON THE MEND

BY SUSAN MCDONALD

GRAD STUDENTS ARE HELPING MOTHER NATURE RESTORE THE GUADALUPE DUNES



ON THE SURFACE, THE GUADALUPE DUNES are teeming with life.

Lupines, coreopsis, poppies and dozens of other native plants bloom on the sandy hills and creep along deep ravines. Deer and coyotes play hide-and-seek; hawks circle overhead. The place is crawling with reptiles and insects.

It's beautiful. But what's lurking underneath is a different story. Diluent, a hydrocarbon used to thin crude oil, leaked for decades from the rusty pipes and tanks at the 2,700-acre Guadalupe oil field, threatening to contaminate the nearby Santa Maria River and the ocean. The leak is estimated at 8.5 million gallons.

A group of Cal Poly grad students is experimenting with native plants, microbiology and chemistry to help Mother Nature and the oil company to clean up the pollution.

The oil field's owners, formerly Unocal, now Chevron, began cleanup efforts when the contamination was first discovered in the mid-1990s. Since then, Cal Poly researchers have been contributing to the decontamination efforts.

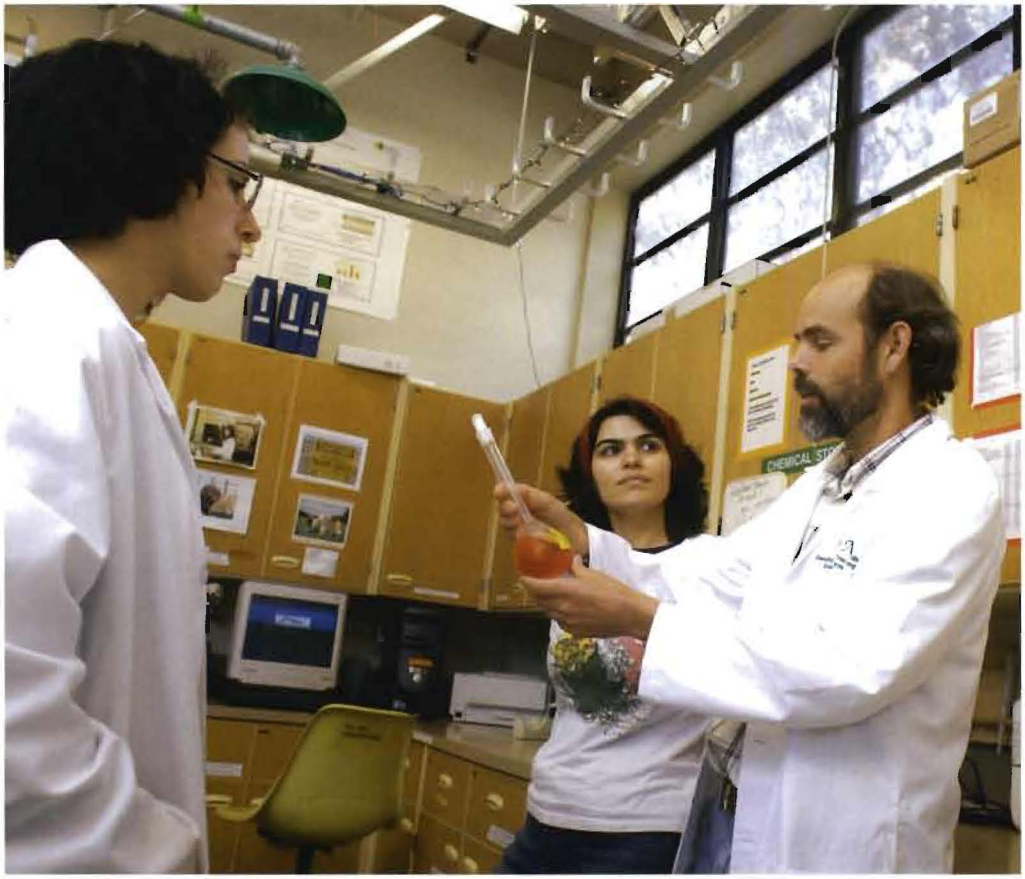
In collaboration with Cal Poly's Environmental Biotechnology Institute, a handful of grad students, assisted by biology Professor Chris Kitts and environmental engineering Professor Yarrow Nelson, are currently working on some new Chevron/Unocal-funded projects at the dunes and in a lab on campus.

TESTING THE WATERS

A small campus lab, crammed with equipment, is where environmental engineering majors Meghann Chell and Laleh Rastegarzadeh experiment with anaerobic biodegradation. They hope to unravel the natural process of breaking down hydrocarbons without using oxygen.

Their first challenge was to collect groundwater and transport it to the lab without exposing it to air. The students created a transport barrel, where water is pumped in and air is blown out. At the lab, they pump the water into specially designed glass bottles.

The water bottles sit inside a tall glass "glove box." For their experiments, the students add an amendment to each bottle of water to see what works to speed up the natural breakdown of hydrocarbons. The amendments – sulfates, nitrates,



From left, grad students Meghann Chell and Laleh Rastegarzadeh work in the lab with Professor Yarrow Nelson.

iron, manganese – are found naturally in the dunes.

Chell and Rastegarzadeh are monitoring the hydrocarbons and changes in the gases with the assistance of Ken Hanson, a fellow grad student who runs the chromatograph to analyze the changes. "This project is so fascinating," said Chell. "It's a big challenge and really rewarding. It's so specialized, we're starting to speak another language."

Rastegarzadeh, originally from Iran, said she appreciates the environmental education she is getting. "I definitely feel fortunate to be here. This is a chance to look at a disaster, to learn the nature of it, and then take what we learn to other sites."

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NATIVE PLANTS MAY HOLD THE KEY

Other students are experimenting with willow trees and different native plants to discover how they might speed up the biodegradation process. To do that, they're testing the natural effects of the contamination on willows planted in plastic crates at the oil field, and they take water samples from the dunes site to run tests on trees growing in the lab.

Environmental engineering majors Eileen Mick and Kevin Crossley and chemistry major Eric Appel are examining the chemical changes in hydrocarbons during bioremediation.

Stephen Huang is studying the effect of diluent on willows, as well as lupines, yarrow, coastal mint and spectacle pods. "I'm trying to learn what the plants can tolerate," said Huang.

Agapito Diaz, a student from Guam, is studying "natural attenuation," or how biodegradation occurs naturally on the site. He wants to take what he's learning back to Guam where there are serious problems with saltwater intrusion and nitrates in the island's drinking water.

They've even coined a term for their work: "ecomediation," which means using the entire ecosystem as a remedy. It's a very long process, according to Professor Kitts. "What we're looking at is not something that happens overnight. It may take 200 years for the hydrocarbons to be eaten up."

The students are also learning to use a geographic information system to map the oil plume under the sand. The oil companies have already removed more than 360,000 cubic yards of contaminated soil and are planning to take away another 360,000 cubic yards soon. The soil is trucked to Santa Maria, where it is used to cover a landfill.

"It's important to remove as much as possible," said Professor Nelson, "but it's not possible to truck all of it away. Our goal is to biodegrade the remaining hydrocarbons on the rest of the site."

For more information about Cal Poly's Environmental Biotechnology Institute, go to the Web site *http://www.ebi.calpoly.edu/*.

Life goes on at the dunes. Photos by Gonzalo F. Garcia, Chevron Environmental Management Company